REMARKS

Claims 1 through 13 are now presented for examination. Claims 1, 2, 4, 9, 10, 12 and 13 have been amended to define still more clearly what Applicant regards as his invention, in terms which distinguish over the art of record. Claims 1, 9, 12 and 13 are the only independent claims.

The drawings have been objected under 37 C.F.R. § 1.84(p)(5) in that the reference characters 27, 55, 58, M1 and M2 are not mentioned in the description. It is proposed that Figs. 5, 6 and 12 be amended to remove these reference characters. Approval of the replacement sheets submitted herewith making these changes is respectfully requested.

Claim 12 has been objected to in that the phrase "from responsive to" at line 7 appears to be in error. The objected-to phrase has been deleted in Claim 12 as currently amended.

Claims 1-13 have been rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent 5,227,948 (Boon et al.) in view of U.S. Publication 2002/0121615 (Nakasuji). With regard to the claims as currently amended, this rejection is respectfully traversed.

Independent Claim 1 is directed to magnetic guiding apparatus that guides a moving member along the length of a sliding member by attracting a target disposed along the sliding member or beam length by electromagnets provided on the moving member. In the apparatus, a magnetic flux detection unit movable along the length of the sliding member detects the magnetic flux along the length of the target. A position measuring unit measures the position of the magnetic flux detection unit along the length of the sliding member. A detecting unit detects the position of the magnetic flux peak along the length of the target based on output of the

magnetic flux detecting unit and the position measuring unit. A demagnetization unit performs demagnetization at the detected position of the magnetic flux peak.

Independent Claim 9 as currently amended is directed to stage apparatus in which a target has a length along a direction and a moving member is guided by the target and is movable along the length of the target. Electromagnets provided on the moving member produce a force between the target and the electromagnets. A magnetic flux detecting unit is provided on the moving member to detect magnetic flux along the length of the target. A position measuring unit measures the position of the moving member along the length of the target and a detecting unit detects the position of magnetic flux peak along the length of the target based on the output of the magnetic flux detecting unit and the position measuring unit.

Independent Claim 12 as currently amended is directed to a demagnetization method that performs demagnetization of a magnetic guide apparatus which has a moving member that moves along a target. According to the method, the magnetic flux along the length of the target is detected by a magnetic flux detecting unit that is movable along the target. The position of the magnetic flux detecting unit is measured along the length of the target. The position of the magnetic peak along the length of the target is detected based on the measured position and the detected magnetic flux. Demagnetization is performed at the detected position of the magnetic flux peak.

Independent Claim 13 as currently amended is directed to magnetic guiding apparatus that guides a moving member along the length of a beam by attracting a target disposed along the length of the beam by electromagnets provided on th the moving member. In the apparatus, a

magnetic flux detector that is movable along the length of the beam is configured to detect the magnetic flux along the length of the target. A position measuring unit is configured to measure the position to measure the position of the magnetic flux detector along the length of the target based on the output of the magnetic flux detecting unit and the position measuring unit. A demagnetizing unit performs demagnetization at the detected position of the magnetic flux peak.

In Applicant's view, Boon et al. discloses an electromagnetic device that positions a body (5) by means of at least two electromagnets (13, 15). A position sensor (29) measures the size of an air gap (23) between one of the electromagnets (13, 15) and a guide beam (1). An output signal of the position sensor (29) is applied to an electronic control unit (35) which passes a control current through the electromagnets (13, 15) in dependence on a difference between the measured and a desired size of the air gap (23). An electronic multiplier (47, 59) is connected between the control unit (35) and each of the electromagnets (13, 15), multiplying a control signal from the control unit (35) by the output signal from the position sensor (29). In this way, a force exerted by the electromagnets (13, 15) on the guide beam (1) depends exclusively on the value of the control signal and not on the size of the air gap (23) so that a position-independent control is obtained. Such an accurate position-independent control may be used in an optical lithographic device for the irradiation of semiconductor substrates. Alternatively, such an electromagnetic support with a position-independent control may be constructed so as to form a micro-manipulator.

In Applicant's opinion, Nakasuji to disclose a charged particle beam (CPB) microlithography system that effectively cancels the effects of floating external magnetic fields

and that exhibit a high magnetic shielding ratio using small components. The system has a search coil situated and configured to detect external magnetic field. A compensation coil situated and configured to produce a magnetic field that, based on the detected magnetic field, cancels the external magnetic field. These coils desirably are situated downstream of an illumination lens. The external magnetic field detected by the search coil is converted to a corresponding electrical signal by an external-magnetic-field-detection circuit and routed to an external-magnetic-field-compensation circuit to which the compensation coil is connected. The external-magnetic-field-compensation circuit cancels the external magnetic field by providing an electrical current, corresponding to the detected external magnetic field, to the compensation coil. A search coil and compensation coil also can be provided in a similar manner downstream of a second projection lens, and provided with a respective external-magnetic-field-detection circuit and external-magnetic-field-compensation circuit.

According to the invention of Claims 1, 9, 12 and 13, magnetic flux is detected by a magnetic flux detection means along the length of a target together with the position of the magnetic flux detection means. The position of the magnetic flux peak along the length of the target is detected based on the detected magnetic flux output and its measured position. In Claims 1, 12 and 13, demagnetization is performed at the detected position of magnetic flux peak. Advantageously, the magnetized position in the target is identified by moving the magnetic flux detection means in the entire movable region on the target and detecting magnetic flux and storing position information and magnetic flux information of the target.

Boon et al. is directed to teaching controlling the air gap between electromagnets 13

and 15 and a guide beam 1 and, as noted by the Examiner, Boon et al. does not disclose magnetic flux detection means for detecting magnetic flux of a target. Boon et al. only teaches a position sensor (29) that measures the size of the air gap (23) between one of electromagnets 13, 15 and a guide beam. Such air gap measurement, however, fails to teach or suggest the feature of Claims 1, 9, 12 and 13 of measuring the position of a magnetic flux detection means along the length of a target or the length of a sliding member or beam on which a target is disposed. It is a further feature of Claims 1, 12 and 13 that the position of a magnetic flux peak along the length of the target is detected and demagnetization of the magnetic flux peak is performed. Accordingly, it is not seen that Boon et al.'s air gap control is in any manner related to the features of measurement of magnetic flux and its position along the length of a target or the detection and demagnetization of a magnetic flux peak of Claims 1, 9, 12 and 13.

Nakasuji may disclose an arrangement for detecting and canceling magnetic fields external to a charged particle beam optical system. As disclosed at paragraph 0032 in Nakasuji, an external field detected by a search coil 21 on a fixed on a projection lens 13 is converted into an electrical signal. In response to the electrical signal, a magnetic field compensation coil 22 generates an external field canceling magnetic field. The Nakasuji disclosure, however, is restricted to teaching the use of fixedly located search and compensation coils, fails in any manner to suggest a target disposed along the length of a sliding member with a moving member that moves along the sliding member to provide magnetic flux detection and position measurement of the detected magnetic flux as in Claims 1, 9, 12 and 13. Further, Nakasuji only generates a canceling magnetic field which is completely different than detecting the position of

a magnetic flux peak or performing demagnetization at the position of the magnetic flux peak as in Claims 1, 9, 12 and 13.

With regard to the cited combination, Boon et al.'s disclosure is restricted to measuring and controlling the size of an air gap between electromagnets and a guide beam but is devoid of any suggestion of measuring the position of a magnetic flux detection means <u>along the length of a target</u> or detecting the position of a magnetic flux peak along the length of the target and demagnetizing the magnetic flux peak position as in Claims 1, 9, 12 and 13. Nakasuji only discloses the detection of an external magnetic field by a fixed search coil in a charged particle beam optical system and generating a canceling magnetic field by a fixed magnetic field compensation coil but is devoid of any suggestion of detecting the position of a magnetic flux peak along the length of a target and demagnetizing the detected magnetic flux peak position. Accordingly, it is not seen that the addition of Nakasuji's canceling of an external magnetic field by a fixed magnetic field compensation coil after detection by a fixed search coil devoid of any suggestion of measuring positions of magnetic flux along the length of a target and detecting and demagnetizing a position of magnetic flux peak to Boon et al.'s measuring and controlling of an air gap between electromagnets and a guide beam devoid of any suggestion of detecting magnetic flux along the length of a target and measuring its position to detect the position of a magnetic flux peak could possibly suggest the features of Claims 1, 9, 12 and 13. It is therefore believed that Claims 1, 9, 12 and 13 as currently amended are completely distinguished from any combination of Boon and Nakasuji and are allowable.

For the foregoing reasons, Applicants submit that the present invention, as recited in

independent claims 1, 9, 12 and 13, is patentably defined over the cited art, whether that art is taken individually or in combination.

Dependent claims 2-8, 10 and 11 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicants further submit that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicant's attorney, Steven E. Warner, may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,

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